St. MARY'S UNIVERSITY

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MASTER OF PROJECT MANAGEMENT PROGRAM

POSSIBLE IMPACT OF IMPLEMENTING PROJECT BASED LEARNING ON KNOWLEDGE AND SOFT SKILL DEVELOPMENT OF GRADUATE STUDENTS, IN THE CASE OF AAIT, SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.

BY – SELOME GIRMA BEKELE

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Contents

Acronyms

AAiT - Addis Ababa institute of Technology

NACE – National Association of Colleges and Employers

CEM – Construction Engineering Management

MOST – Ministry of Science and Technology

ETIP – Engineering and Technology Internship Program

INGO – International Non-Governmental Organization

LBL – Lecture Based Learning

PBL – Project Based Learning

SPSS – Standard Statistical Package for Social Science

STEM – Science, Technology, Engineering and Mathematics

LKSL – Likert Scale Level

TVET – Technical and Vocational Education

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Abstract

AAiT is one of the earliest engineering faculties in Ethiopia. School of civil and environmental engineering is the department in this faculty with biggest number of graduates each year. AAiT is currently applying a lecture based learning system which is a kind of "chalk and talk" process. This study focused on the possible impact of implementing a student centered teaching approach called project based learning, which is being implemented in world wide range. The research used a descriptive study. The study has found that the inconvenience of the current teaching approach to come up with the intended skilled man power. The study also figured out that students' inclination to a practical teaching approach, and found how it may affect positively if project based learning approach is applied in the department of civil and environmental engineering on development of students' knowledge and soft skill ability using the four month internship program as a model.

CHAPTER ONE: INTRODUCTION

1.1 Background

Education is the major tool being used to change the world. As illiteracy is the most powerful enemy for development, knowledge is believed to be the most effective weapon to overcome problems following illiteracy. Education centers are means of implementing this strategy all over the world. Especially higher education centers play a great role in creating well skilled workforce. Education can be addressed to the beneficiaries through different curriculums or approaches. The most known are traditional teaching approach and project based learning approach. The former which is teacher-centered; is a lecture based and spends mostly in classroom lectures where students are not allowed to experience and interpret the world other than the classroom. They are restricted to just sit and listen what their lecturers give them, which forced them to think with the limit of their instructor's teaching and explaining ability. The second one is a kind of student-centered; which is practical and is exercised outside classrooms. Here, students are exposed to real world problems and are expected to solve problems they face on that particular problem or project. This approach helps in developing student's soft skills like; communication, creativity, collaboration, problem solving, in-depth understanding of situations, project managing and other critical skills which will help them when they exposed to community and work environment.

Engineering is a field of study which emphasized on creating graduates in engineering profession. Field of engineering inclined to practical activities and field works rather than office works. Which implies the work environment of the field creates interaction with people who are at different knowledge level and gathered from different environment.

Though, it has been more than half of a century since the field of engineering education is started in Ethiopia, the field of study is dominated by "Chalk and Talk" system, which holds back the growth and effectiveness of outcome of the field. It has a gradual change in addressing quality education and creating intended knowledge and skill on the field, it is still not satisfying the stakeholder's expectation and needs. This is basically because of the curriculum the faculties are using. The curriculum being used in Addis Ababa institute of technology (AAit) which is the former engineering faculty in Ethiopia, is a combination of lecture, Group and individual assignments, projects, and a four month internship.

Each year hundreds graduate from Addis Ababa institute of technology, school of civil and environmental engineering. These graduates level of performance is under questionwhich is shown from previous studies (Eshetie Berhan and Sisay Geremew, 2018). Employers are not getting the expected efficiency on their performance level and soft skill required at different work position. They tried to verify the effect of four month internship program to fulfill the perception of employers, graduates and Universities. A four months internship is never enough to practically experience and acquire important skills and knowledge expected from a civil engineer; which is the core idea, that initiates the researcher to dig and see impact of implementing project based learning approach to AAiT. Project based learning inclined to a self-directive learning system by which students are exposed to real world problems and teach themselves to overcome the situation. Since engineering and technology education is more about projects and design, the field needs a lot to work on improvement of students soft skills combined with academic knowledge.

1.2 Statement of the problem

AAiT is one of the biggest engineering institutes in Ethiopia, founded as the University of Haile Silassie I established in 1955 in Addis Ababa. Different departments are under the administration of this institute. Currently, it takes five years of attainment in this institute to finish and graduate from any of its departments in a regular program and seven years for extension. School of civil and environmental engineering is one of the departments which is the former and with the highest number of students. This department aims at giving adequate knowledge in areas of structural, highway, geotechnical and water resource fields of study.All of graduates from here are expected to contribute to development of their country through implementing what they have earned in these programmed years. But students are observed when they lack skills and feel frustration while exposed to the real world projects and programs. Being dormant & confused, problem of critical thinking and being drain brained about the work environment are common issues for many graduates from this institute. This is because they lack skill to solve real world problems under different circumstances by themselves.

The curriculum emphasizes on lecture-based learning approach, which does not give a chance to develop student's ability in content knowledge, reasoning, interpersonal skills and other practical experience. Within the context of "a graduate" from engineering institute, focusing on just academic activity cannot create the intended workforce, especially for such developing country

like Ethiopia. Most students graduate without technical know-how about their field of study and basic skills like, reasoning, interpersonal & communication skill, project management skills and others which cannot be captured through content and lectures in classrooms which is the widely used approach in AAiT. Therefore, the country is not benefiting from graduates who are consuming its budget invested on such institutes. Students are engaged in internship program for a semester on related field of work. This plays a great role in experiencing the work environment, though it can never be enough in capturing all needed knowledge of four and half year's lecture in just four months.

Therefore the problem that is planned to be assess in this research is how it would affect the intellectual maturity of graduates from AAit if project based learning approach is adopted as a curriculum.

1.3 Objectives of the study

1.3.1 General objective

The general objective of this study is to investigate possible impact of implementing Project based learning approaches, in the case of AAiT, school of Civil and environmental engineering.

1.3.2 Specific Objectives

- Assess the drawbacks of current teaching approach being used in AAit.
- To study the impact of applying PBL on enhancing students interest to the subject matter.
- To investigate the effectiveness of PBL in providing capability of acquiring and applying knowledge in real world scenarios
- Impact of PBL in achieving required competences in the market (that fulfill either organizational or skill/academia current demand.)

1.4 Basic research questions

The research aims to answer the following questions

- What is pitfall of current curriculum in AAit?
- How does Project based learning approach will impact graduate's soft skill?
- How PBL can affect satisfaction of the market and other stake holders?

1.5 Significance of the study

Education is a key factor in process of development of a given country and its application too. Specially, higher education centers play a great role in enabling students. Addis Ababa institute of technology is one of these centers which believed to contribute a lot in creating and graduating advanced man power in different fields of engineering. Therefore, tools and education media on the process of teaching and learning is the most important thing attention should be given so that the big goal can be achieved through this process. On this specific study the researcher aims on determining the drawbacks of the current teaching approach being implemented currently and see the positive impact of using project based learning. It is believed that educational centers will consider such researches investigate and improving their teaching approach to achieve the main objective of their institutes'.

1.6 Scope of the study

This study is limited to the teaching approach being used at Addis Ababa institute of technology, school of civil and environmental engineering. The study used the data collected from graduating class of 2015 G.C.

1.7 Limitation of the study

- Since the main data collection instrument is questionnaire, there is gap in expectation and real data collected through this method. Due to different reasons some people might be biased while filling the questionnaire.

1.8 Organization of the study

The study is presented in five distinct chapters, in which abstract is at the very beginning of the paper where the whole idea of the study is summarized and presented. Following the abstract, First chapter is presented as an introductory for the study. Literature reviews compiled on chapter two; core and related literatures which guide the researcher while working on the whole paper are included in this chapter.

The third chapter focuses on methodology of data collection and analysis used. Detailed methodology is presented in this chapter including the reasons why each method selected and implemented.

Data analysis and presentation are showed on the fourth chapter of the paper. Analyzed data using different techniques are presented with regard to their effect on the research questions of

the study. Finally conclusion and recommendations are made on the last chapter of the paper. The researcher made some conclusions from the information gathered through data analyses and give recommendations based on different theories and studies made earlier. References and appendixes are also attached at the end pages of this paper.

CHAPTER TWO: LITERATURE REVIEW

2.1 Review of theoretical literature

2.1.1 History of Education in Africa

The essential place of education in development has never been disputed. Indeed from time immemorial the establishment of schools was seen as the first stage of developing a nation or a people. The ability to read and write was the first requirements in earlier times for a person to take the first steps on the road to self-betterment. Being able to read was the key to further knowledge and access to further information. The ability to write allowed a person to actively participate in development projects and processes. Basic education was seen as absolutely essential to the earl y stages of the development of a person and indeed the development of a nation. This had never been disputed. In the early years of African independence, many presidents of new nations adopted the FFPE (Full Free Primary Education) strategy to education, e.g. Hastings Banda of Malawi, Azikiwe of Nigeria, Kaunda of Zambia.

2.1.2.Education in Ethiopia

Alemayehu Bishaw, in 2012 has stated on his book that, Ethiopia's economic development is largely dependent on an educated workforce, yet one of the greatest limitations to educational progress is a disadvantaged economy . Fortunately, the Ethiopian government understands the value of education and currently dedicates a significant amount of resources towards its development at all levels. Recognizing the need for 21stcentury workers who are skilled in science, technology, mathematics, and engineering (STEM), Ethiopian universities are steering students towards these STEM-related degrees.

Studies show that the notion of problem solving was introduced in Ethiopia after the Dergue regime has been destroyed by EPRDF. The EPRDF destroyed the past philosophy 'education for education purpose' and emphasize on a pragmatic approach by valuing education in terms of only solving immediate problems (Areaya, 2008). But basically the education system is not geared towards this philosophy. It is hanged up by the past epistemology that relies on rote memorization and focus on exam instead of growth and better life. For pragmatist, the teacher is a facilitator not authoritarian. The method of instruction is problem solving, experiential learning, inquiry methods, and field trips. Learning is in groups and in individual. There is no rote memorization and imitation. But this notion really does not exist in the schools; one major reason is absence of good environment in general and large class rooms in particular. Another

reason for this upon the researchers' observation is low engagement of students in the learning process and taking no responsibility of their own learning (AwekeShishigu, 2015).

It is understood that the history of foreign involvement in Ethiopia's history, particularly in the area of education - where curricular decisions, selection of instructional languages, and cultural considerations - have shaped the evolution of education in Ethiopia. Consequently, while foreign investment and aids will likely play an important role in Ethiopian education, those who are developing the educational system are strongly encouraged to focus primarily on meeting the needs of the Ethiopian people, with the knowledge and skills necessary to be successful, not only in the cultural and political context of East Africa, but also to prepare Ethiopians to be world African Nebula, Issue 5, 2012, Citizens, skilled at operating in a global marketplace of commerce and ideas. Consequently, the educational system of Ethiopia must simultaneously be culturally relevant and flexible/responsive. This may be accomplished when International Non-governmental Organizations (INGO) partners effectively with Local Non-governmental Organization (LNGO) (O"Sullivan, 2006). Ethiopia must invest heavily in teacher training and development. An educational system is only as good as its teachers. One of the consequences of a rapidly expanding educational mission is the inability to build and maintain instructional capacity. Ethiopia has a deficit in quality teacher training and continuing education (Hoot, Szente, and Tadesse, 2006). It is therefore recommended that the training of teachers should be made a priority, especially when introducing new approaches and curricula.

2.1.3. Traditional VS Modern Education in Ethiopia

The Ethiopian church education is rooted in idealism. The aim of education is transmission of cultural heritage and preparation of future priests. The teacher is a role model to be imitated by students and teaching is through lecturing. An important feature of church education in Ethiopia is that education equips students with wisdom of goodness, discipline, order and self-control. The Ethiopian church education was fully idealism. However, this notion is not limited only on church education but also to the modern education established in 1908. This influence have grown in our education system, students are tested to ensure that they achieve the required goal. The schools task was really to prepare students to pass the exam, students are expected to read, memorize and imitate. Few years ago in even our universities memorization were practiced and students were directed towards passing the exam. The authoritarian role of the teacher in our schools now and her/his expectation of passive behavior of the students

have no difference from the church schools. Education was viewed as the process through which knowledge is transmitted from generation to generation. The agents of education were considered to be teachers who impart knowledge, and learners who have little roles in the process. Generally, knowledge was considered sacred and unchanging and thus to be learned as it is. This wrong concept of epistemology affects the pedagogy which emphasized rote learning and memorization which was the main methodology in the church school also. This problem was spread into the modern system of education to have developed into common and persistent constraint of the process of teaching and learning.

The modern education launched in 1908 does not have another dimension other than the philosophy of church education. The notion and philosophical basis for education that is rote memorization is highly manifested in modern schools of Ethiopia for a long period of time. However, the contents and purpose of education depends on the political ideology of the Emperors, for instance during the Dergue regime they hold socialist ideology with Marxism Leninism philosophy; the purpose of education was to equip students with socialist ideology and strengthening their military arm. Implications and Insight into the Future Currently the educational system is criticized of quality. Though there are many factors for the decline, lack of conducive environment in general and large classroom in particular plays a pivotal role. This is because collaborative work and the notion of active learning that the policy dictates are unthinkable in such situations.

Due to the country's economic level it is clear that, Ethiopian students hope learning to over through their poverty and then help their poor parents. But, unemployment makes the graduates hopeless and initiates them to migrate, seeking a promising work in other countries which leads to brain drain. Thus, learning must lead to immediate value hence unemployment should be resolved. Find job opportunity outside the country officially as of many other countries if all jobs are assumed to be saturated inside the country through. Another solution might be producing flexible curriculum that serves the needs of all students that helps develop the higher-level skills, by including native language as a medium of instruction at all levels of education. Negash (2006) stated as follows to mention the importance of language in Ethiopian education system, "modernization through westernization is a project doomed to failure and it results loss of identity".

The philosophies of modernism and post modernism have a strong impact on the design of the school curriculum, leading to far-reaching consequences (Dennis, 2002). Therefore, clear conceptions of modernism and post-modernism are important for addressing contemporary curriculum analysis. Through the history of Ethiopian education, there was a shift from traditional to modern education as it is discussed above; since modernism is now on anomalies, I believe that it is now time to shift the system to post-modernism. In Ethiopia, there is a burden of dissatisfaction for students as well as teachers and bureaucratic inflexibility and unresponsiveness to change among all stake holders as a result of modernism. Some of features of modernity are: inflexible decision-making, unmanageable structures, linear planning, unresponsiveness to changing societal needs, loss of meaningful senses of community (Hargreaves, 1994).He stresses that modernity is not only problematic but is in a crisis state.

In contrast, Post-modernism has an eclectic nature; it depicted that creating and choosing is more important than ordering and following. Therefore, it is important to choose and combine traditions selectively, that is selecting those aspects from past and present which still appear most relevant. Dennis (2002) asserts that since change is exponential, it is not possible to say with certainty what the citizens of the twenty-first century will need from their schools. And thus the postmodernist view assumes that the aims, objectives, content, pedagogy, evaluation and direction of the curriculum are not fixed, but fluid. In a modernist curriculum, evaluation is basically conducted to separate winners from losers. However, in Post-modern curriculum, there is no ideally set standard, no principle which serves as a universal reference point. The teacher would play a central role in the evaluation process but would not be the exclusive evaluator; evaluation would be collective and interactive. It would be used as feedback, to help students to develop intellectual and social powers through dialogue and constructive critiques (Doll, 1993, cited in Dennis, 2002). But it requires highly professional staffs that are confident, resourceful and ready to meet the challenges for successful implementation of the curriculum.

Post-modern curriculum possess the features: process-oriented rather than focus on the product only, lays emphasis on the development of higher order thinking skills and fosters creativity, the teacher is no longer the authority in the classroom but a facilitator, helping children construct knowledge. Knowledge is not simply transmitted, it should not be prescriptive and system driven, foster self-organization.(AwekeShishigu, 2015)

2.1.4. Project based learning (PBL)

PBL is rooted in the progressive education movement, which advocated for more student centered and experiential approaches to education that support "deeper learning"1 through active exploration of real-world problems and challenges (Pellegrino and Hilton, 2012; Peterson, 2012). Inspired by the philosophies of John Dewey, William Heard Kilpatrick developed the "project method," which is cited as the first formalization of a PBL model (Peterson, 2012). For Kilpatrick, the key to the "project method" lay in its being "an activity undertaken by students that really interested them" (Ravitch, 2000, p. 179). Kilpatrick's ideas were disseminated widely among teachers and administrators during the progressive education movement but have been significantly revised since. Notably, PBL and other student-centered and inquiry-based approaches have historically encountered resistance and criticism by those who emphasize the importance of students' developing specific content knowledge in traditional subject areas (Kirschner, Sweller, and Clark, 2006; Loveless, 2013; Peterson, 2012; Ravitch, 2000). However, PBL and other instructional approaches that emphasize deeper learning and the development of skills needed for success in college, career, and civic life have become increasingly popular (Huberman, Bitter, Anthony, and O'Day, 2014; Scardamalia, Bransford, Kozma, and Quellmalz, 2012).

There are a number of reasons for the appeal of PBL and other deeper learning strategies among education reform advocates and practitioners, particularly in the last decade. First, despite decades of reform, poor postsecondary outcomes for high school graduates persist, particularly for low-income students (Bailey and Dynarski, 2011). Large numbers of students who graduate from high school and enroll in college fail to pass the mathematics and English/language arts placement tests, requiring them to enroll in remedial classes before being deemed "college-ready." It has been estimated that around 60 percent of community college students enroll in remedial courses (Bailey, Jeong, and Cho, 2010). This trend has contributed to a low completion rate in postsecondary education for academically underprepared and low income students. Fewer than half of the students who begin public two-year colleges earn a credential or transfer to a four- year institution within six years of their initial enrollment (Barbara Condliffe, 2017).

Problem-Based Learning (henceforth PBL) is a methodological approach to teaching in which learners solve problems of varying degrees of complexity (frequently based on actual cases) using any resources they think may be of use.

Problem-based learning is not a new concept. In the early 1970s, it was first formally used by faculty in medical schools that were dissatisfied with the quality of students' professional preparation. The pioneers of PBL in medicine, Barrows and Tamblyn (1980), define the approach as "the learning that results from the process of working toward an understanding or resolution of a problem". Although PBL has its origins in the training given those studying for legal practice in the English-speaking world (and not medicine, as widely believed), the authors credit the teaching program devised by the School of Medicine at McMaster University in Canada in the 60s and 70s with its first application to the sciences. Since then, a variation of PBL has been developed in response to the necessity of professional education; including the various branches of engineering and architecture. Although these adaptations have seen considerable variation from the original model, the essential features of the McMaster program have been retained.

In the 1990s, the use of PBL expanded into other areas of education in professional schools including architecture, education, law, engineering, and management. This approach has been further developed in the alternative curriculum, blending PBL with elements of conventional teaching into a hybrid. Gallagher et al, describe the characteristics of a PBL course as follows:

- Learning is student-centered.
- Learning occurs in small student groups.
- The instructor is a facilitator or a guide.
- Problems form the organizing focus and stimulus for learning.
- Problems are a vehicle for the development of problem-solving skills.
- New information is acquired through self-directed learning.

As of Dr. Namhun Lee, in CEM education especially, project-based learning has been considered to be interchangeable with problem-based learning. However, there is a major difference between project-based learning and problem-based learning. Problem-based learning mainly focuses on the process of problem-solving and learning while project-based learning focuses on the outcome of a project.

As of the research of Rodríguez González's (2016) on problem based learning approach; here are essential features applied to engineering as follows;

2.1.4.1. Applying PBL: essential features for engineering education

1. Learner-centered teaching

Students should take responsibility for their own learning under the guidance of a tutor who takes on the role of consultant. The areas about which the consultant advises include, but are not limited to, identifying the essential features of the problem in question to enable the students to fully grasp it and take an suitable approach, and directing students to appropriate sources of information, such as books, journals, engineering projects, technical legislation, teachers, and internet resources. The aim is for the learning to center on the specific skills and knowledge required to solve the problem in question, and for these to be tailored to the student,

2. Small groups

In the field of the sciences, work groups comprise from 5 to 8 students, whilst Rodríguez González' recommend just 3 or 4 in the area of engineering. Once each teaching module is finished, groups are randomly reconfigured so that students learn to work productively with different people.

3. Teacher as facilitator

The teacher takes on the role of facilitator or tutor, challenging the students to question their thinking and to find the best approach towards understanding and resolving the problem. As the course progresses, the students become able to take on this role themselves and make the same demands of each other.

4. Generating appropriate problems lies at the core of learning and developing organizational skills

For the disciplines concerned, PBL presents students with a problem, which is structured according to a given format, such as a case-study. An example would be the design and execution of a retaining wall to well-defined structural specifications. The objective is to set a task which faithfully reproduces the kind of challenge the students are likely to meet in practice, so that the work is seen to be relevant and is infused with an intrinsic motivation. In order to gain an understanding of the problem in hand, students need to identify the areas of applied knowledge which they will need to study within the technological sciences. The required information is drawn from various disciplines, and is likewise applicable to similar problems in other subjects, such as Structural Theory or Environmental Engineering. The desired outcome is

to make it more likely that the student retains what he or she has learned and is able to apply it in the future.

5. Developing skills through problems

So far as possible, problems for the engineering disciplines should derive from real life or be a very close representation of it, involving the kind of applications which the students are likely to meet in the context of their future professional lives. For example, the basic legislation governing the use of reinforced concrete is largely standardized; likewise, the components and properties of each kind of concrete are well-defined. Nevertheless, the way in which these are used in actual situations vary according to the kind of problems specific to each specialism, whether building irrigation canal or reinforcing tunnels for mining. There is wide variation in terms of both the construction procedures to be followed and the best available solutions. Hence, the problems themselves adopt specific features appropriate to the branch of engineering in question, whilst the underlying scientific and technological basis is largely the same.

6. Self-directed learning as a means to new knowledge

Lastly, students are expected to learn from their understanding of real world situations and the accumulation of experience, by means of their own study and research, and the information supplied by the experience of previous authors. In the course of this phase of self-directed study, the students work together, constantly discussing, comparing, and reviewing what they have learnt. This is the most important aspect of PBL for the future engineers, not only because it is a highly effective means of improving their performance in problem-solving, but it also undoubtedly ensures the development of professional competences.

2.1.4.2 Implementation of PBL

The PBL approach can theoretically be implemented in any subject area. As a result, PBL design principles do not communicate specific disciplinary concepts and practices. However, some PBL scholars set guidelines for the types of questions and topics that a student should encounter, as well as the relationship between the PBL approach and other curriculum and pedagogy featured in the course (Darling-Hammond et al., 2008; Krajcik and Shin, 2014; Larmer and Mergendoller, 2015a; Parker et al., 2011, 2013; Thomas, 2000):

● **Driving Questions to Motivate Learning: Larmer and Mergendoller** - (2015a), Krajcik and Shin (2014), Parker et al. (2011, 2013), and Thomas (2000) have all emphasized that the

PBL unit/curriculum should be motivated by a driving question. Driving questions are at the core of the project-based science design principles (Krajcik and Shin, 2014). Krajcik and MamlokNaaman (2006) explained: "a driving question is a well-designed question that students and teachers elaborate, explore, and answer throughout a project". Krajcik and colleagues provided the following five criteria forhigh-quality driving questions: 1) feasible, 2) worthwhile, 3) contextualized, 4) meaningful, and 5) ethical (Krajcik and Mamlok-Naaman, 2006; Krajcikand Shin, 2014). Some driving questions from project-based middle school science curricula are: "How do machines help me build big things?" and "Why do I need to wear a helmet when I ride my bike?" (KrajcikandMamlok-Naaman, 2006).Krajcik and Shin (2014) and Parker et al. (2011, 2013) described the influence of thedriving questions on the design of a unit/curriculum. Krajcik and Shin noted that in a project based science curriculum, driving questions provide "continuity and coherence to the full rangeBlumenfeld and colleagues (1991) laid the groundwork for the project-based science design principles; these have been further developed over the years by teams consisting of Krajcik and colleagues (KrajcikandBlumenfeld, 2006; Krajcik and Shin, 2014; Krajcik, Blumenfeld, Marx, and Soloway, 1994).of project activities". Project-based science teachers continually revisit the drivingquestion as students learn new material and engage in new activities. Parker and colleagues also emphasized the importance of students continually revisiting the driving question (referred to as a "master question" in their curriculum) for the PBL course and individual PBL units. Theyexplained that "looping" back to driving or "master" questions is critical to achieving the deeper learning goals of the courses. For example, in their PBL curriculum for an Advanced Placement U.S. Government and Politics course, Parker et al. (2011) indicated that the project cycles are united by a "master question" of "what is the proper role of government in a democracy?" As students move through the course, they continually revisit this question and "try again"to answer it, reflecting on what they are learning in each new project cycle.

● **Target Significant Learning Goals**: Some PBL design principles address the issue of the content of a PBL curriculum (Darling-Hammond et al., 2008; Krajcik and Shin, 2014; Larmer and Mergendoller, 2015a; Parker et al., 2013; Thomas, 2000). In their description of "Gold Standard PBL" on the Buck Institute for Education (BIE) website, Larmer and Mergendoller (2015a) stated that a well-designed PBL approach should teach "students the important content standards, concepts, and in-depth understandings that are fundamental to school subject areas and academic disciplines." They also emphasized the importance of PBL focusing on "success

skills" such as critical thinking, self-regulation, and collaboration. Darling-Hammond and colleagues (2008) noted that the central problem or project of PBL and other inquiry-based approaches should be designed to maximize the chances that students will be exposed to "big ideas specified in the learning goal". Other researchers have highlighted the fact that the subject matter or the topic of a PBL approach should be authentic and related to important issues in the real world (Parker et al., 2013; Thomas, 2000). Krajcikand Shin (2014) discussed the importance of designing PBL curricula around learning goals that align with national standards. They explained that learning goals are stated as "learning performances" that bring together the "core ideas" from the discipline with key "disciplinary practices".

● **Use Projects to Promote Learning:** The integral role of the project is clear in all the project-based learning design principles cited in this review. Parker and colleagues (2011, 2013) and Thomas (2000) directly addressed the issue of how to position the PBL project within the broader curriculum. Thomas explained that projects should be "central, not peripheral to the curriculum". What clearly distinguishes PBL from other instructional approaches is that projects are not the culmination of learning (as they often are in standard classrooms), but instead are the process through which learning takes place. For example, Parker and colleagues (2013) argued that projects must be the

Design principles for inquiry-based learning are included in this review of project-based learning because the authors are explicit about the fact that PBL is a type of inquiry-based learning and they provide extensive discussion of PBL (Darling-Hammond et al., 2008). "Spine of the course" and should be thought of as the "main course, not dessert".

● **Dedicate Sufficient Time to PBL**: While the centrality of a project approach within a single PBL unit is clear, the design principles are generally vague about the time spent on PBL versus other instructional strategies in a semester-long or full-year course. What is the ideal balance between PBL and other types of instruction within a course? Could a one- or two-week PBL unit within a traditionally taught course be considered PBL? How long does a PBL unit need to last for it to be considered PBL? The design principles offered by Parker and colleagues (2011, 2013) and Thomas (2000) require that a PBL approach guide the curriculum and instruction of an entire course and not just appear in a single, time-limited unit. With one exception (Grant, 2002), all other design principles reviewed here are related to students conducting in-depth or extended investigations, which clearly require a good deal of time. Ravitz (2010) specified that PBL

instruction should "occur over an extended period". Most PBL advocates would likely agree that a relatively short PBL unit as part of a traditionally taught, teacher-directed course is not truly PBL. However, more specificity regarding the time dedicated to a PBL unit and the relationship between PBL and other pedagogical strategies within a course would be useful.

2.1.4.3. Teaching and Learning Theories for Problem-Based Learning

Behaviorists postulate that learning can be caused by external stimuli in the environment and is indicated by an observable behavior. Learning outcomes as a result of behavioral responses to stimuli can be shaped by succeeding reinforcement. In terms of PBL design, behaviorists claim three phases: analysis, research, and problem-solving. The emphasis when designing PBL must be on analyzing the behavioral objectives and assessing learner performance with criterion referenced tests. In the PBL approach, learning should be reinforced through teaching strategies such as frequent cues, stimulus-response chaining, feedback, and repertoires.

Jonassen' posits that behaviorism and cognitivism are primarily objectivistic in that they both consider learning and knowing to be the process of representing an objective reality. Under this paradigm, learners strive to learn target objectives by the passive transfer of knowledge. On the contrary, constructivism claims that learners construct their own knowledge through interacting with the external world and interpreting the experience. This learning process will be facilitated when learners are actively involved in a real-world context through collaborations and social interactions. From the constructivist's view, the instructor should provide students with a learning environment embedded in a real-life context where students can interact with peers to accomplish a task. By doing so, students can realize multiple perspectives to solve a problem and critically think of what they learned. In this case, the instruction should accurately describe the task, not define the structure of learning required to accomplish a task.

According to Hmelo and Evense, the major goals of PBL are problem-solving, self-directed learning, and team-based or collaborative learning skills. Especially for a professional education, the followings are generally assumed:

- Learning is a constructive process, not a receptive process
- Self-monitoring skills called metacognition affect learning
- Social and contextual factors influence learning

Learning results from learners' actions and instructions play a vital role when they enable and foster constructive activities. Thus, Dr. Namhun Lee indicates that the instructor should focus on helping students be able to acquire the aforementioned skills in their learning. In the PBL approach, real-world problems serve as the stimulus for learning. By analyzing and solving problems, students acquire requisite knowledge, critical thinking and problem-solving skills. Students encounter real-life and open-ended situations in a small group and the instructor guides and facilitates the learning process by asking questions and monitoring the problem solving process.

2.1.4.4. Strategies of Problem Based Learning (PBL)

For different study of science, there are lots of variations in how PBL strategies are implemented; But the four most frequently suggested strategies are (MatthewsSmith, Oberski, Gray, Carter & Smith, 2001; Sararinen-Rahiika& Binkley, 1998; Lusardi, Emery & Lake, 1997; Stern & D'Amico, 2001; Lake, 2001; Vernon & Blake, 1993):

1. **An absolutely "integrated" PBL approach to an intact curriculum:** all didactic and psychomotor learning revolves in the region of the case-based tutorial progression.

2. **A modified PBL core curriculum**: case based tutorials are used from the first semester of study to incorporate content transversely synchronized basic science, clinical science and professional development course.

3. **A conventional PBL program**: the program may commence with a combination of habitual delivery and introduction to PBL methods. There is increasing emphasis on small group tutorial, student-centered learning and assimilation of content across courses as student's progress through their arrangement of study.

4. **A single PBL lessons or unit within a preparation of study**: in which one or more courses in a curriculum focus on small group, case-based or context- based discovery of patient care.

2.1.4.5. Critics on Project-Based Learning Approach

On one hand, much research has focused on virtues of PBL, advocating its benefits in higher education. For example, Knowlton argues that the generic characteristics of PBL can promote an active and collaborative environment. Numerous studies show that PBL promotes more in-depth understanding of content than traditional pedagogical approaches, increasing student's interest, motivation, and engagement in learning. On the other hand, some researchers argue that the PBL

approach may limit students' opportunities being exposed to broader content. While PBL focuses on higher-order thinking and better retention of knowledge over a longer period of time, it may lessen students' initial knowledge acquisition. Thus, students may feel the initial transitions into PBL to be difficult due to students' lack of foundational knowledge about the subject at the initial stage and the unfamiliarity with their own role in PBL.

In the PBL approach, students are expected to analyze a problem and identify resources for problem-solving. Students familiar with the traditional teaching paradigm may have difficulty in adjusting their active roles in learning at the initial stage. Despite these discomforts at the initial stage, students are generally satisfied with PBL due to its promotion of social skills, communication skills, and problem-solving skills. According to Schultz-Ross and Kline, PBL is considered as an effective method of learning and instruction which can be employed for higher education.

The other point researchers raise here is the evaluation system of students, in traditional education students are evaluated through tests, quizzes and other paper based measurements. But coming to PBL approach the evaluation mainly focuses on the level of critical thinking and problem solving skills that are generated through self-directive learning process which some researches argues as it is difficult students in this approach.

2.1.4.6 Problem-Based Learning in Construction and Engineering Education

With the assumption that PBL can change the traditional teaching paradigm, Dr. Namhun Lee (2013) demonstrates that there have been several efforts in CEM education in the attempt to incorporate the PBL approach into CEM courses. Traditionally in CEM education, the project-based learning approach has been widely used for engineering management courses. Kajewski proposed a PBL course called 'Professional Studies.' The course emphasized student-centered and self-directed learning. The course was divided into several units, each unit included one problem, and students were forced to solve the problem through research and collaboration. McIntyre applied the PBL approach into a capstone course to provide students real-world design and construction practices. In addition to these, there have been some attempts to integrate the PBL approach into CEM education. Previous PBL applications in construction education show the satisfactory results. The PBL approach will be able to bring positive impact on CEM courses. The following summary on some characteristics when PBL is incorporated into CEM courses is presented by Dr. Namhun Lee:

- Learning can be initiated with real-world problems which require specific CEM domain knowledge to think critically and solve the problems.
- Problems can drive students motivated and engaged in the student-centered and self-directed learning.
- Students as a group can be actively involved in problem-solving, thereby improving their social, communication, and collaboration skills.

The characteristics of PBL may give the instructor some challenges. For instance, the instructor should find the best way of monitoring and facilitating students' learning process to provide valuable resources as well as useful feedback. Therefore, it is extremely significant to investigate how and what technology can support in PBL.

Engineering education remains dominated by the "chalk and talk" technique, despite the large body of education research that demonstrates its ineffectiveness. Structural engineering education also remains dominated by this pedagogy, with a heavy emphasis on lecture-based delivery of the theories of structural analysis and the behavior of common construction materials. The integration of these fields rarely occurs. Concern about the effectiveness of this approach has been raised by practitioners, professional bodies and educators. The use of project based learning is proposed as one means of overcoming these concerns, as projects enable students to understand the synthesis of structural analysis, material behavior, constructability and economic reality that occurs in the professional practice of structural engineering. (Julie Mills, 2002)

Jullie Mills in his research for A Case Study of Project-based Learning in Structural Engineering, studied at University South Australia discussed the development of the study, including the theoretical framework and the measures of effectiveness used. Students' and industry's perceptions of the skills necessary for successful practice in structural engineering are examined as well as the students' perceptions of the value of the course projects and other components as a means of attaining these skills. From his study he concluded; study has shown that students' perceptions of the generic and technical skills that will be important for successful structural engineering practice agreed closely with those of a senior industry group in that area of engineering. In addition the students indicated overwhelmingly that they perceived the design project component of the curriculum in the case study course he designed as being the most effective component for gaining these skills. This perception was supported by the results achieved, which were significantly higher for the project components than the examination

components of the course, and by the author's observations, student journals and interview record.

2.1.4. Internship

An internship is a period of training carried out by a student within a company or organization. Basically, the objective of internship program is to expose students to the real world of work and in the process, provide feedback to institutions on the relevance or otherwise of the curriculum (Adebakin 2015). Through internship programs or experiential education settings, students learn by doing within the organization or company. Such an experimental learning assist students to achieve intellectual goals through broad range of academic endeavors, from volunteer activities and services to practicum and internships. According to Simons Et al, 2012, two of the most common forms of experimental learning are the practicum and internship The main difference between the two is simply the degree of expected involvement of the student in the real work. While in the case of practicum the participation of the student in performing tasks is to a limited extent, internship involves independent application of skills and knowledge in the workplace setting. Internship is defined by the National Association of Colleges and Employers (NACE) as: "a form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting (RI-University, 2012). It gives students the opportunity to gain valuable applied experience and make connections in professional fields they are considering for career paths; and give employers the opportunity to guide and evaluate talent. Investigation on experimental learning have noted improvements in personal (i.e., discipline related knowledge) and interpersonal (i.e., communication skills) civic (i.e., cultural competence and social responsibility) and professional (i.e., career interests) development among undergraduate students (Simons et al., 2012). According to (Brown, 2010), internships offer carefully planned and monitored work experience with the goal being to gain practical skills from on the job exposure. Students in technical disciplines, when questioned, mention benefits such as obtaining real-world experience, learning more about a company, applying theoretical and analytical knowledge acquired in class, networking, and gaining hands-on experience (Clements & Cord, 2013).

The benefits of internships in engineering and technology fields are recognized by leaders in the discipline, business and industry representatives, and students. Literatures show that internships have been described by industry leaders as "a critical tool" to help prepare graduates to successfully enter the workplace (Clements & Cord, 2013). Among the different benefits mentioned by different scholars include promote academic, career and/or personal development, balance the intern's learning goals with the organization's needs, enhance work place related and soft skill development, and allow students to get the opportunity to apply their knowledge and skills in a professional setting while still in school.

The major stakeholders in internship program are Industry, Educational Institutes, Students, Mentors/Supervisors, Government and NGO's (Mgaya&Mbekomize, 2014; Ndibuuza, 2016). An internship providing company can be offered by any type of organization, large or small, for-profit or not-for-profit, and within any industry or economic sector (Haddara&Skanes, 2007). It has been more than 100 years since internship in engineering program began to be implemented in United States of America. The program faces lots of resistances both from traditional educators and uncommitted industrialists; however, this program expanded very quickly and proved to be successful. Moreover, the trend is used as a model in educational institutes in different disciplines (Haddara & Skanes, 2007). International educational program like Pacific Rim Experiences for Undergraduate Program (Prime) and German Academic Exchange Service, focus on research based internships where interns are employed from abroad countries to work with researchers and professors in hosting country. The key motivator for this kind of program is the demand of workforce that works collaboratively across cultures and disciplines to address major global challenges (Arzberger et al., 2010; Institute of International Education, 2009). In Australia, for example, host organizations are more involved in internships management and selection of students to undergo industrial attachment (Mgaya&Mbekomize, 2014). However this is not the case in Ethiopia, because the facilitation and management mostly relied on University-Industry linkage unit at the universities. In Ethiopia internship/externship is considered as a link between university and industry. As referred in MOST (2013) the university industry linkage is necessary to let students, academic staffs, and TVET trainers gain practical learning opportunities in industries. Even if engineering and TVET students are allowed to be engaged in practical learning in industries, the outcome is not as expected when it is referred to student-to- mentor

and student-to supervisor ratio (MOST, 2013). There exists also a major variation among the different higher education institutions in the implementation of the mandatory internship program in terms of prior preparation, placement, supervision and evaluation. Whereas the implementation of internship programs in Ethiopia is a recent phenomenon, its role particularly on the enhancement of technology and engineering education is believed to be vital. With this end the countries science, technology and innovation policy indicated internship programs as one means of integrating universities with local and international organizations.

2.1.4.1 Internship program in Ethiopian engineering education

Sisay Geremew and Eshetie Berhanto, 2018; took a research to present the impact of the mandatory Engineering and Technology Internship Program (ETIP) on development of student's soft skills. They defined internship as it is a period of training carried out by a student within a company or organization. Basically, the objective of internship program is to expose students to the real world of work and in the process, provide feedback to institutions on the relevance or otherwise of the curriculum (Adebakin 2015). Through internship programs or experiential education settings, students learn by doing within the organization or company. Such an experimental learning assist students to achieve intellectual goals through broad range of academic endeavors, from volunteer activities and services to practicum and internships.

A previous study has generalized the extent to which internship program affects as follows despite its flaws in implementation and administration; internship programs in Ethiopia have an important part in the academic curriculum. It plays a crucial role of help in undergraduate students to make the connections between their traditional coursework and the workplace. Apart from its impact on the academic and practical education it also provides students with a keen insight into work and research culture. Additionally the impact of internship on the interpersonal skills of undergraduate students is highly appreciated by the findings of the survey. (Sisay Geremew and Eshetie Berhanto, 2018)

Framework for high quality project based learning

According to the project management Institute Educational and the William and Flora Hewlett Foundation, there is a lack of agreement about what goes into high quality Project Based Learning. Various models and guidelines for PBL have been created by experts and

organizations in recent years. These are typically written from the perspective of the teacher. The Framework for High Quality Project Based Learning describes PBL in terms of the student experience and is intended to provide educators everywhere with a shared basis for designing and implementing good projects.

The Framework for High Quality Project Based Learning is based on the accumulated experience, wisdom, and research of hundreds of educators who have graciously shared their ideas and critique. It describes six criteria, each of which must be at least minimally present in a project in order for it to be judged "high quality." The presence of a criterion, however, is only a beginning. Each criterion can be judged in turn as to the quality of its implementation. Problems that are the most memorable and that have the greatest impact on student learning and development will be those with the highest quality implementation of each criterion. The six criteria are presented as follows;

1. **Intellectual challenge and accomplishment** - Students learn deeply, think critically, and strive for excellence.
2. **Authenticity** - Students work on projects that are meaningful and relevant to their culture, their lives, and their future
3. **Public product** - Students' work is publicly displayed, discussed, and critiqued
4. Collaboration - Students collaborate with other students in person or online and/or receive guidance from adult mentors and experts
5. **Project management** - Students use a project management process that enables them to proceed effectively from project initiation to completion
6. **Reflection** - Students reflect on their work and their learning throughout the project.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the research methodology that has been applied to this study. Methodology is a systematic and theoretical analysis of the methods applied to the field of study. Methodology is the general research strategy that outlines the way in which a research project is to be undertaken and, among other things, identifies the methods to be used in it. These Methods, described in the methodology, define the means or modes of data collection or, sometimes, how a specific result is to be calculated. Methodology does not define specific methods, even though much attention is given to the nature and kinds of processes to be followed in a particular procedure or to attain an objective.(Howell,2013) Any description of a means of calculation of a specific result is always a description of a method, and never a description of a methodology (Katsicas,2009,).

3.2 Research design and approach

A survey research methodology is adopted in this research. Survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It uses cross-sectional study using questionnaire and structured interviews for a collection with the intent of generalizing from a sample of population (Fowles, 2008). Therefor the research design used both quantitative and qualitative methods to analyze data collected through questionnaires and semi structured interview one; in which non experimental design is used, survey.

This impact assessment survey starts with the selection and formulation of survey questions and ensuing design of range of structured interview questions to be used to evaluate the extent to which the current teaching approach or program on civil and environmental engineering education quality at AAiT. These techniques include descriptive a survey of teaching approach currently being used by the institute, nearly all graduates of the year 2015 from department of civil and environmental engineering, as well as other stakeholders involving in the institute, who are believed to give essential information for the study. Furthermore, the survey is designed in such a way that it permits to identify range of satisfaction graduates get from the curriculum which in turn influence the way they become skilled and academically able in interpreting the lecture they have given in to solutions for real world problems.

Due to its multidisciplinary nature and diversification of target groups, this survey uses a combination of qualitative and quantitative approaches. While the quantitative approach involves the generation of data in a form that can be subjected to rigorous quantitative analysis including associations and multivariate analysis, the qualitative approach is concerned with the subjective assessment of attitudes, opinions and expectations. More specifically , descriptive methods of the quantitative approach are used to form a database from which to infer characteristics or relationships of population. This usually means survey research, where a sample of a population is studied (questioned or observed) to determine its characteristics, and it is then inferred that the population has the same characteristics. In the qualitative method, the technique of focus group and depth interviews were used. Focus group is a type of in-depth interview accomplished in a group, whose meetings present characteristics defined with respect to the proposal, size, composition, and interview procedures (Freitas et.al 1998). While this survey employs a flexible design that provides opportunities for considering many different aspects of the situation, an accurate description of a situation or of an association between variables is also sought, where appropriate, to minimize bias and maximize the reliability of the data as collected and analyzed.

3.3 Target population

Target population of this study is graduates of Addis Ababa institute of technology for the year 2015 from school of civil and environmental engineering. The total graduates at this given academic year were 675

3.4 Samples and sampling technique

Generally, the sample size for any study depends on the following major points namely: acceptable level of significance or confidence interval, population standard deviation, and margin of error. This is the level of tolerance where the sample mean may deviate from the population mean. For this specific study the researcher decides the sample size using Fowler's (2009) sample size table with confidence level = 95%, margin of error = 5.0%, and population size of 675, it is found to be n = 234 in number.

Table 3.1 Fowler's sample size (2009)

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678		3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

3.5 Data collection methods

Primary and secondary methods are employed for the purpose of data collection. Discussing about primary data, a standard survey questionnaire was used to collect information and data from respondents and a technique of structured & unstructured interview was also used to collect raw data from whom the issue is directly related. Due to the well-known fact that online surveys have a lower response rate than other modes of surveys, the study uses self-completion of paper questionnaire delivered by the researcher.

First part of questionnaire was used to collect some demographic data and views of graduates of the institute on how well the current curriculum generally fits to their field of study. Their expectation and what exactly happened while staying in the university is also seen under this part of the questionnaire. The rest of the questionnaires were used to collect respondents' views on teaching approach adopted by the university and their view towards PBL, using an internship program as a model. For time and budget limitations the researcher has to apply and see the impact of implementing PBL approach in reality, she assumed the four month internship program as a model to represent the real project based learning program; which is found easy and closely related to the overall goal of project based learning. Moreover, their views on importance of attitude towards the program, the impact of the internship program on critical thinking, problem solving ability, communication approach and over all soft skill an engineer should acquire were addressed. Through the interview and open ended questions the researcher has investigated possible impact that will be gain from implementing PBL.

Likert scale is used to assess and measure graduates perception where 5 – Likert scale is used for this specific study. Five point Likert scale with: 1= Strongly Agree, 2= Agree, 3 = Neutral, 4= Disagree and 5= Strongly Disagree. The descriptive statistics which are in the form of mean and standard deviation were presented . However, while making interpretation of the results of mean the scales were reassigned as follows to make the interpretation easy and clear.

With 5 point scales, the interval for breaking the range in measuring each variable is calculated by 5−1/5= 0.8. It means items with scores that fall between the ranges of: 4.21 – 5.00 are considered as strongly disagreed; 3.4 – 4.20 as disagreed: 2.61 – 3.4 as Neutral; 1.81 – 2.6 as agree and 1.00 – 1.8 strongly disagree. This formula is adapted from (Vichea, 2005).

3.6 Evaluation of scientific instrument

Evaluation of data and analysis entertained mainly using standard statistical packages for Social Science (SPSS) to show the descriptive results and to examine any cross-tabulation for the quantitative data. Moreover, Reliability based on internal consistency was measured by extracting a statistic known as Crobach's coefficient alpha from SPSS. As indicated on Table 3.1, below the resulting Cronbach's alpha coefficient (0.804) indicates that the reliability of the data collection questionnaire is consistence and appropriate to get data that will enable to generalize about the entire population.

Table 3.2 Reliability Test

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.804	.781	26

Source: SPSS

With regard to secondary data, mainly electronic sources were used to get data on number of engineering and technology discipline graduates from different universities. Moreover, various assumptions were made based on available facts particularly to make it understandable the general idea of Project based learning by assuming that AAiT's internship program has the same procedures with basics of PBL.

CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION

4.1 Introduction

In this chapter, the result obtained from the questionnaire survey are presented and analyzed. First demographic characteristics of the respondents are presented. It follows with a summary respondent's reply on various variables presented to them. Then it follows with description of the data gathered, discussed and analyzed the findings carefully in order to assess possible effect of implementing project based learning on achieving the most important performance of a civil engineer which are academic knowledge and soft skills. The finding's has been organized in accordance with the study objectives.

Consequently, this chapter presents the results and findings of the research. The chapter mainly includes data results from the statistical tests conducted on the gathered primary data.

4.1. Response rate

Two hundred thirty four questionnaires were distributed to the respondents and out of these questionnaires; two hundred three were collected with valid responses that accounts 86.75% response rate. Accordingly, the analysis of this study is based on the number of questionnaires collected. Here the statistical program used for the analysis and presentation of data in this study is the Statistical Package for the Social Sciences (SPSS) version 25.

4.2. Respondents general information

4.2.1. Gender

Table 4.1 Gender

Gender

		Frequency	Percent	Cumulative Percent
Valid	Male	124	61.1	61.1
	Female	79	38.9	100.0
	Total	203	100.0	
Total		203	100.0	

Source: SPSS

Table 4.1, shows the distribution of gender from valid respondents. 61.1 % of the respondents were male and the rest 38.9% were female.

4.2.2. Respondents stay at AAIT

Questionnaires distributed intentionally for graduates of the same year from same year entry, so that additional year in the institute for any of the reasons would not affect the perception of respondents towards the curriculum and teaching approach adopted by AAiT.

4.3. AAiT's current teaching approach

Table 4.2 Teaching Approach

Teaching approach

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lecture based learning	203	100.0	100.0	100.0
Missing	System	0	0.0		
Total		203	100.0		

Source: SPSS

As result is indicated on table 4.2, all the respondents agreed that lecture based learning is being implemented. From a personal interview with respondents the researcher has found that Addis Ababa institute of technology gives 4 and a half year lecture classes, which is teacher centered system, for students attending department of civil and environmental engineering.

Table 4.3 Real word projects

Real world projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	203	100.0	100.0	100.0
Missing	System	0	0.0		
Total		203	100.0		

Source: SPSS

Real world project experience other than internship program has got a 0 % response, as shown on table 4.3. Respondents clearly stated on the opened question that the only real world project experiencing chance is gained at the internship program for four continuative months on the fourth academic year.

4.4. Attitude towards current teaching approach

The first four questions were designed to analyze respondent's attitude towards the current teaching approach being implemented by AAiT. As the analysis indicates on table 4.4, under the first two questions LKSL 3 & LKSL1 imply disagreement with mean of 4.34 & 4.45 are resulted. The standard deviation for these items is 0.591 & 0.477.

The above mean result implies students were not familiar and clear with the basics of their field of study and lecture classes were not interesting and motivating.

For the last two remaining items which are LKSL4 and LKSL2 mean is found to be 1.48 & 1.25 respectively and with standard deviation of 0.606 & 0.456, which shows an agreement that the institute is currently using class lecture as the main approach and the standard deviation result for all of the questions indicates that the values tend to be close to the mean of the set.

Table 4.4 Attitude towards AAiT's teaching approach

	Items	Valid N	Mean	Std. Deviation
LKSL1	I was clear with all ideas of my field of study.	203	4.45	0.591
LKSL3	The class lectures were interesting and motivating.	203	4.34	0.477
LKSL4	Interest to a field of study matters on knowledge acquired during the study.	203	1.48	0.606
LKSL2	The curriculum AAiT was using is focused on class room lecture.	203	1.25	0.456

Source: SPSS

4.4.1. Impact of LBL for competency on the field

Mean analysis on the statistics for item LKSL18 and LKSL19 indicates disagreement towards those questions. As shown on table 4.5a there item 18 results a mean of 4.30 & 4.16 and deviation of 0.462 & 0.364. These numbers indicate that a five year academic year could not make these civil engineers to be confident on their job career for that matter they were not familiar with basic technical words. Language of the work environment is not easy to catch so that they can implement their knowledge on the field. Communication is the other difficult issue for these people. To communicate means to talk same language or to be able to understand what is being done for a common goal. All individuals on one project are assigned there to take their responsibilities and every work is interdependent to one another, to get a result of satisfactory all should play their role, here is where to speak same language is very important.

Table 4.5a impact of LBL for graduates' competency on market

	Items	Valid	Mean	Std.

		N		Deviation
LKSL18	I was comfortable, familiar and confident with the work environment on my first site visit.	203	4.30	0.462
LKSL19	I was familiar with technical words that were being used on project / construction sites.	203	4.16	0.364

Table 4.5b impact of LBL for graduates' competency on market

	Items	Valid N	Mean	Std. Deviation
LKSL21	I face a problem on cop upping with the work environment while exposed to projects.	203	1.62	0.520
LKSL22	Foreman has a better knowledge than a graduate civil engineer.	203	1.96	0.697
LKSL23	A foreman on my first project career had a better knowledge and soft skill than I had.	203	1.98	0.782

Source: SPSS

Analysis from the SPSS respondents show an agreement on items listed on table 4.5b, which is designed to investigate impact of the approach exercised by the institute on graduates' competency after graduation on their field of study. As shown on the results all respondents agreed that they face a problem on implementing their knowledge while exposed to the work environment. Even their contribution is very low when compared to Forman engaged on projects which is; summarized from the implication of mean 1.62, 1.96 and 1.98 for items LKSL21, LKSL 22 and LKSL23 respectively implies. Standard deviation of these items 0.520, 0.697 and 0.782 are lower which shows there is smaller dispersion among the data set. This analysis implies that graduates could not be able to show what they have got or did not have enough knowledge to compete a civil engineer as their title indicates. The market became difficult for them even to work with equal contribution as the Forman did.

4.5. Impact of applying PBL

From the data collected Impact of implementing PBL is measured using respondents view regarding to four month internship program and their understanding about the importance of practical teaching approach in developing students' soft skills and academic knowledge.

4.5.1. Effectiveness of internship program

Table 4.6aImpact of internship program

	Item	Valid N	Mean	Std. Deviation
LKSL26	Internship program help you more than the lecture classes for your job career.	203	1.74	0.678
LKSL25	Civil engineering field of study needs to be given on practical teaching approach.	203	1.67	0.721

Source: SPSS

Responses from item LKSL26 & LKSL25 on table 4.6a, shows how internship program helped them on their job career. A statistics value of mean 1.67 (agreement), under LKSL 25, where respondents choose the practical teaching approach for this given field of study implies the four month internship program plays a great role more than that of the lecture classes.

Table 4.6b impact of internship program b

	Item	Valid N	Mean	Std. Deviation

LKSL24	Four month internship program is enough to acquire the intended knowledge for civil engineer.	203	4.57	0.680

Source: SPSS

Mean from table 4.6b, which is a value of 4.57, shows disagreement towards period of internship program that is just four months on the fourth academic year. Respondents' reply for this item implies that the time schedule is not enough with respect to the benefit they gain from this program and also with regard to the field of study, civil engineering, which need more practical exercises as their answer shows on table 4.6a.

4.5.2. Acquiring knowledge and soft skill through PBL

Table 4.7a Importance of soft skills_a

	Items	Valid N	Mean	Std. Deviation
LKSL14	Soft skill is important parallel with academic knowledge.	203	1.7	0.479
LKSL15	Ability of critical thinking and problem solving is more important than academic knowledge for a civil engineer.	203	1.58	0.495
LKSL16	Communication and interpersonal relation is a basic at work place of this field.	203	1.74	0.527

Source: SPSS

Soft skills like ability on critical thinking, problem solving, communication and interpersonal relations are evaluated through the questionnaire under item LKSL 14, LKSL 15 & LKSL16 as shown on table 4.7a. The table summarizes responses for these questions and found a mean of 1.7, 1.58 and 1.74 respectively, which all fall in the range of agreement. All the questions ask importance of soft skills mentioned above. According to the answers respondents gave for each question they found that soft skills are basic to be a civil engineer. To actively participate and manage the work environment communication and good interpersonal relations should be develop among the different personnel on work place special at construction and project site

where people gather from different environment with totally different level of educational background. Critical thinking and problem solving ability is very important when the work environment is exposed to newly emerging problems every day, like construction sites.

Table 4.7b Importance of soft skill b

	Items	Valid N	Mean	Std. Deviation
LKSL17	Classroom lectures are supposed to be supported with practical teaching approach to build students soft skill.	203	1.70	0.458

Source: SPSS

With a mean value of 1.70 from SPSS analysis on table 4.7b respondents agree on support of practical teaching approach to develop students' soft skill. They believe practical approach should be exercised to acquire to empower students to the extent where the field of study is needs.

- From the semi-structural interview and open ended questions made for individuals on the sample, the implementation of project based learning approach is recognized and accepted as the type of approach that can fits to civil engineering field of study.

4.6. Importance of PBL

The samples were first oriented about the idea of the whole study on this paper, and some points concerning PBL approach so that they can fill the questionnaire comfortably and at least with basic knowhow to PBL.

Table 4.8 Importance of PBL

	Items	Valid N	Mean	Std. Deviation
LKSL12	I accept the effectiveness of PBL than lecture based learning In	203	1.44	0.499

	acquiring academic knowledge			
LKSL13	Both academic knowledge and softskill can be achieved through Problem/Project based learning approach.	203	1.43	0.513

Source: SPSS

An agreement mean scale for items LKSL12 & LKSL 13 with standard deviation of 0.499 & 0.513 respectively is analyzed as shown on table 4.8. These items are designed to measure inclination of respondents towards the effectiveness of implementing PBL approach to their field of study at AAiT. The average value 1.44 on the first item on table 4.8 implies respondents' interest and acceptance for practical teaching approach and 1.43 mean value shows the achievability of both academic knowledge and soft skill through PBL, on the basis of their experience on internship program.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

From the study the researcher has summarized the findings as follows;

5.1. Summary of findings

- Students were not familiar and clear with the basics of their field of study and lecture classes were not interesting and motivating.
- The Institute, AAiT is currently using class lecture as the main approach.
- Five academic years could not make these civil engineers to be confident on their job career for that matter they were not familiar with basic technical words. Language of the work environment is not easy to catch so that they can implement their knowledge on the field. Communication is the other difficult issue for these people. To communicate means to talk same language or to be able to understand what is being done for a common goal. Graduates were not able to take their responsibilities and work interdependently satisfactorily.
- Internship program helped on graduate's job, career. The practical teaching approach for this given field of study, the four month internship program, plays a great role more than that of the lecture classes though the time schedule is not enough with respect to the benefit they gain from this program.
- Critical thinking and problem solving ability is very important when the work environment is exposed to newly emerging problems every day,
- Achievability of both academic knowledge and soft skill is well observed through implementation of practical based learning.

5.2. Conclusions

Based on the finding of the study the following conclusions are drawn:

- The teaching approach at AAiT is a teacher based. Where the teaching and learning process is dominated by the teacher and students did not get the chance to experience what it really means and looks like practically, the lecture they take in class room. This implies their world is bounded in just class rooms and teaching ability of lecturers.
- Academic knowledge and soft skills like critical thinking, communication skill, interpersonal relations and problem solving ability are crucial on the field of civil engineering. As the work environment is exposed to a collection of variety of people, each of the mentioned and other soft skills are important to manage and take responsibilities on projects.
- Internship program was the one that holds their survival on the field. Though it is a very small period of time when compared to the semesters they spent on lecture class, they would not survive as an engineer without it. Either this four month practical learning season is not enough to visually grasp what has been covered in class room lectures and intended soft skill to their field of study, not even close.
- Graduates are not confident, comfortable, and ready to be exposed to work environment due to having fear in taking risks and responsibilities. Lack of technical knowhow on the field of study and lack of ability in communicating, creating good interpersonal relations and lack of reasoning to give solution for different problematic situations lead them to this fear. Both of mentioned reasons above have a big impact on being competent at many related vacancies. Employers also tend to choose experienced man power rather than graduates, for the reason these graduates lack practical knowledge and the work environment needs it seriously.
- Graduates have a positive attitude towards the importance of project based learning, in which they could achieve intellectual abilities and get a driving force to get in to their field of study deeply. Graduates believe that a practical teaching approach is the one that fits for civil engineering field of study to get the intended man power.

5.3. Recommendations

- Civil engineering is about designing and constructing it needs skilled man power who can interpret untouchable abilities in to touchable and visible construction outputs. Knowledge and soft skills can never be developed just through lecture based teaching approach, AAiT shall do more researches to investigate gain and losses from applying lecture based learning for students of civil and environmental engineering department.
- AAiT shall give a chance for its students to understand their attitude towards its teaching approach and how it can be improved.
- AAiT need to share experiences on teaching approaches of technology universities from abroad and adopt the best that fits to its goal. on how the implementation process shall be, to practice project based learning approach and then use it for a better outcome.
- Ministry of education of the country shall give attention for the teaching approaches being used at different educational centers because such institutes like AAiT are becoming a reason of increasing number of unemployed individuals instead of creating self-employed citizens.
- Since education is a base for a country's development progress, more researches shall be expected on improvement of learning and teaching strategies in Ethiopia.

Reference

Tietz, B., "Design education." The Structural Engineer, 75(18),325-326 (1997).

Suprenant, B.A., "What is a structural engineer?" ASCE Civil Engineering, 57(8),6 (1987).

Lahoud, P.M., "Structural engineering education practice and liability." In Education and continuing

development for the civil engineer. Proceedings of the National Forum April 17 -20, 1990, American Society of Civil Engineers. 108-114. (1990).

Dym, C.L., "Learning engineering: Design, languages and experiences." Journal of Engineering Education, 88(2), 145-148. An expanded version is available on-line at http://www2.hmc.edu/~dym/EngrngEd.html (1999).

Perrenet, J.C., Bouhuijs, P.A.J. & Smits, J.G.M.M., "The suitability of problem-based learning for engineering education: theory and practice." Teaching in higher education, 5(3),345-358 (2000).

Kolmos, A., "Reflections on project work and problem-based learning." European Journal of Engineering Education, 21(2).141-148 (1996).

Hadgraft, R.G. and Young, W., Teaching Strategy.Department of Civil Engineering, Monash University. Available on line at http://www.eng.monash.edu.au/civil/teaching/vision(1998).

Heitmann, G., "Project-oriented study and project-organized curricula: A brief review of intentions and solutions." European Journal of Engineering Education 21(2), 121 -131 (1996).

Lenschow, R. (1998). From teaching to learning: A paradigm shift in enginee ring. European Journal of Engineering Education. 23(2),155-161.

Fink, F.K. (1999). Integration of engineering practice into curriculum -25 years of experience with problem based learning.

Kjersdam, F. (1994). Tomorrow's engineering education -The Aalborg experiment. European Journal of Engineering Education, 19(2), 197 -203.

Creese, R. (1987). A project-centred engineering program. Engineering Education, 78(2), 100 -104.

Ramsden, P. (1992). Learning to teach in higher education. London: Routledge.

Driver, R. & Oldham, V. (1986). A constructivist approach to curriculum development in science. Studies in Science Education, 13 , 105 -122.

Starr, M. L., & Krajcik, J. S. (1990). Concept maps as a heuristic for science curriculum development: Toward improvement in process and product. Journal of Research in Science Teaching, 27(10), 987 -1000.

Taba, H. (1962). Curriculum development: Theory and practice. New York: Harcourt Brace, Jovanovitch.

Walker, D. (1992). Methodological issues in curriculum research. In P. W. Jackson (ed.) Handbook of research on curriculum.(pp. 98-118). New York: Macmillan.

Nizwardi Jalinus, Rahmat Azis Nabawi, Aznil Mardin (2017), The Seven Steps of Project Based Learning Model to Enhance Productive Competences of Vocational Students, conference paper, Universitas Negeri Padang.

Evensen, D. H., & Hmelo, C. E. (2000). Problem-based learning: a research perspective on learning interactions. Mahwah, N.J.: L. Erlbaum Associates.

Rodríguez González, C.A., Fernández Batanero, J.M.(2016), A review of Problem-Based Learning applied to Engineering, Vol. 3 Nº 1 (2016): 14-31.

Snigdha Barman, (2008), Adoption Of Problem Based Learning (Pbl): An Empirical Study On The Lectuers Of Universiti Sains Malaysia (Usm)

APPENDIX A: QUESTIONNAIRE

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF PROJECT MANAGEMENT

Research questionnaire

Dear Sir/Madam,

I am undertaking a research entitled "Possible Impact of Implementing Project based learning: The Case of Addis Ababa institute of technology, School of civil and environmental engineering" for the partial fulfillment of Masters of Arts (MA) degree in Project Management. This survey is part of academic research that aims to assess the effectiveness of applying project based learning approach to civil engineering students in Addis Ababa institute of technology on their academic knowledge and soft skill which acquire for the field of this study.

The achievement of the research's aim depends on your cooperation in filling out this survey questionnaire, and your precious time and effort in participating in this research will also contribute to the development and improvement of teaching approach in the university and civil Engineers Management ability while exposed to the work environment. I am grateful for your time and responses. You are **NOT** expected to write your name and, I thank you in advance, for your cooperation. All the information you provide will be kept in strict confidentiality and it will be only used for this academic research.

Sincerely yours,

Selome Girma.

If you have any questions, please don't hesitate to contact: +251-9293-949193 or solinagbb@gmail.com or selomegirma01@yahoo.com

Instruction: Please respond to the questions by ticking on the respective box given.

Part I. Respondent's Profile

1. Specify your Gender:

a) Male ☐

b) Female ☐

2. Years spent in the University (AAiT):

a) 4 years ☐ c) 6 Years ☐

b) 5 years ☐ d) >6 years ☐

3. Please state year of graduating from AAiT in Gregorian calendar, _____

4. Please state your educational level:

a) First degree/Bachelor ☐

b) Second degree/Masters ☐

c) If others please specify_____.

5. Please state your current job position: _____.

6. Did you take internship program before you graduated?

a) Yes ☐

b) No ☐

If yes, please specify the type and level of tasks and responsibilities you have been engaged in, and for how long,

_____

_____.

7. Have you ever done other **real world project (Problem) based** assignments whilst on your stay at the university, other than your internship program?

a) Yes ☐

b) No ☐

If yes, please specify the number of those real world problem based assignments you have done and their type,

_____

_____.

8. Which curriculum was AAiT's approach while you were attending in the university?

a) Lecture based learning approach ☐

b) Project/Problem based learning approach ☐

Please state if there is any other_____

9. Do you think the curriculum being used in the university is good enough to create the intended man power both in academic knowledge and soft skill?

a) Yes ☐

b) No ☐

If no, please suggest a type of curriculum, _____

_____

10. Please briefly explain if there was a significant difference between what you expected to get from the university and what you actually have got there,

_____

_____.

R.No	Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

1	I was clear with all ideas of my field of study.	☐	☐	☐	☐	☐
2	The curriculum AAiT was using focused on class room lecture.	☐	☐	☐	☐	☐
3	The class lectures were interesting and motivating.	☐	☐	☐	☐	☐
4	Interest to a field of study matters on knowledge acquired during the study.	☐	☐	☐	☐	☐
5	I have acquired all the intended knowledge with class room lectures.	☐	☐	☐	☐	☐
6	Classroom lecture is enough to be a civil engineer.	☐	☐	☐	☐	☐
7	I am convinced that my field of study should take 4 and 1/2 year of lecture class	☐	☐	☐	☐	☐
8	It is convincing that my field of study should be given in lecture based teaching approach.	☐	☐	☐	☐	☐
9	Soft skill can be learned through lecture based learning.	☐	☐	☐	☐	☐
10	Lecture based learning approach can fit to all field of study.	☐	☐	☐	☐	☐
11	Both academic knowledge and soft skill can sufficiently achieved through Lecture based learning approach.	☐	☐	☐	☐	☐
12	I accept the effectiveness of PBL than lecture based learning In acquiring academic knowledge	☐	☐	☐	☐	☐
13	Both academic knowledge and soft skill can be achieved through Problem/Project based learning approach.	☐	☐	☐	☐	☐
14	Soft skill is important parallel with academic knowledge.	☐	☐	☐	☐	☐
15	Ability of critical thinking and problem solving is more important than academic knowledge for a civil engineer.	☐	☐	☐	☐	☐
16	Communication and interpersonal relation is a basic at work place of this field.	☐	☐	☐	☐	☐
17	Classroom lectures are supposed to be supported with practical teaching approach to build students soft skill.	☐	☐	☐	☐	☐
18	I was comfortable, familiar and confident with the work environment on my first site visit.	☐	☐	☐	☐	☐
19	I was familiar with technical words that are being used on project / construction sites.	☐	☐	☐	☐	☐

20	Soft skill is more important on the field of civil engineering.	☐	☐	☐	☐	☐
21	I face a problem of cop upping with the work environment while exposed to projects.	☐	☐	☐	☐	☐
22	Foreman has a better knowledge than a graduate civil engineer.	☐	☐	☐	☐	☐
23	A foreman on my first project career had a better knowledge and soft skill than I had.	☐	☐	☐	☐	☐
24	Four month internship program is enough to acquire the intended knowledge for civil engineer.	☐	☐	☐	☐	☐
25	The field of study of Civil engineering needs to be given on practical teaching approach.	☐	☐	☐	☐	☐
26	Internship program help you more than the lecture classes for your job career.	☐	☐	☐	☐	☐